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PHOTOTHERMAL MAGNETIC RECORDING MEDIUM FABRICATION METHOD

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PHOTOTHERMAL MAGNETIC RECORDING MEDIUM FABRICATION METHOD

[Konetsu jiki kiroku baitai no seizo hoho]

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[There are no amendments to this patent.]

Claim

A photothermal magnetic recording medium fabrication method characterized in that in a method for fabricating a photothermal magnetic recording medium made of a rare earth-transition metal alloy using a vacuum film formation technique, a photothermal magnetic recording medium is created in an atmosphere containing a reducing gas by introducing the reducing gas during film formation or by substituting the interior of a vacuum chamber with the reducing gas in advance.

Detailed explanation of the invention

Technical field of the invention

The present invention pertains to a photothermal magnetic recording medium fabrication method. In particular, it pertains to a fabrication method for obtaining a rare earth-transition metal alloy thin film while attaining a high level of reproducibility of its photothermal magnetic characteristic.

Background of the invention

Since photothermal magnetic recording, where a laser beam is emitted for thermomagnetic writing, and Kerr effect is utilized for reading recorded [information], involving a large-capacity memory capable of high-density recording, its practical applications as a code information memory and a memory for image files and document files are being expedited.

Prior art and problems

As a conventional material for the aforementioned photothermal magnetic recording medium, a medium created by forming a rare earth-transition metal type amorphous thin film by means of a vacuum film formation technique, such as vapor deposition or sputtering, shows good characteristics.

However, this kind of alloy has a problem that its reproducibility is poor in that its characteristic fluctuate significantly even when it is created under the same conditions. For example, when the vacuum chamber was evacuated to 1×10^{-6} torr, and Tb (rare earth element) and Fe (transition metal) were evaporated respectively at prescribed evaporation rates from 2 evaporation sources, the coercitivity of the film formed on a substrate fluctuated significantly in the range of 3 KOe and 6 KOe.

The cause may be considered as follows. Because said alloy contains a rare earth element which is oxidized easily, it is likely to react with oxygen as a residual gas during the vapor deposition so as to create an oxide of the rare earth in the film. Thus, the composition of the alloy made of the rare earth and the transition metal substantially shifts to the side where less rare earth is present. On the other hand, because the compensating temperature of the photothermal magnetic recording medium made of the rare earth-transition metal alloy is equal to the room temperature, a composition close to the compensated composition is adopted. Coercitivity He shows composition dependency of the kind shown in Figure 1, and the coercitivity is fairly high near the compensated composition.

As such, the rare earth is oxidized selectively during the film formation, and the rare earth element in the film is reduced in terms of alloy composition, so that the coercitivity changes also.

Because the degree of oxidation cannot be regulated during the film formation, the coercitivity becomes likely to fluctuate.

Purpose of the invention

In the light of the aforementioned problem, the purpose of the present invention is to present a method for obtaining a photothermal magnetic recording medium at a high level of reproducibility while preventing the rare earth element from being oxidized during the vacuum film formation.

Configuration of the invention

The purpose of the present invention can be achieved by introducing a reducing gas into the vacuum chamber, or by substituting the interior of the vacuum chamber with the reducing gas in advance, and forming a film in an atmosphere containing the reducing gas.

Application Example 1

In Figure 2, plastic substrate 2 is placed in vacuum chamber 1, and 2 units of electron beam heating sources 3 and 4 are provided with Tb ingot 5 and Fe ingot 6, respectively. After the interior of vacuum chamber 1 was evacuated to 1×10^{-1} Torr, H_2 gas was introduced through gas feeding valve 7 until 3×10^{-6} Torr was reached. Under said atmosphere, Tb and Fe were evaporated simultaneously from the 2 units of electron beam evaporation sources while regulating the evaporation rates in order to form a 1,000 Å thick TbFe film. When the evaporation rate ratio was set at 1.0, and the evaporation was repeated, the coercitivity fell into the range of 5 to 6 KOe, resulting in a reduction of fluctuation.

Application Example 2

While using the same device and configuration, the evacuation was carried out to and stopped once 5×10^{-6} torr was reached, an Argon gas containing 20% of H_2 gas was introduced until 100 torr was reached, and the evacuation was then resumed until 1×10^{-6} torr was reached. At this point, Tb and Fe were evaporated simultaneously from the 2 units of electron beam evaporation sources while regulating the evaporation rates in order to form a 1,000 Å thick TbFe film. When the evaporation rate ratio was set at 1.0, and the evaporation was repeated for film formation, the coercitivity fell into the range of 5.5 to 6 KOe, confirming that the reproducibility during the film formation was improved significantly.

Effect of the invention

With the present invention, a film with little characteristic fluctuation was able to be formed by forming a rare earth-transition metal alloy thin film in an atmosphere containing a reducing gas. Although a film formation method by means of vapor deposition was described in the application examples, the same effect can be expected when sputtering or ion plating is utilized.

Brief description of the figures

Figure 1 is a graph showing the relationship between coercitivity He of the rare earth (R.E.)-transition metal (T.M.) alloy and the compositions of R.E. and T.M.; and Figure 2 is an outline diagram of the interior of the vacuum chamber used in application examples of the present invention.

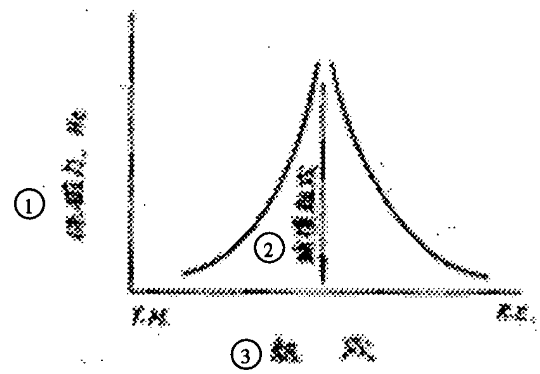

Figure 1

Keys: 1 Coercitivity
2 Compensated composition
3 Composition

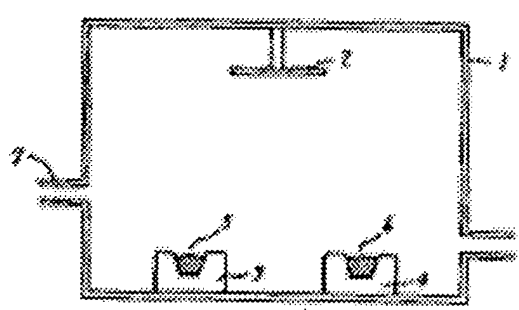

Figure 2